At that time some exceedingly interesting experiments in horticulture were commenced. A small garden was first formed by breaking up the layer of turf on the surface, to enable the sun to thaw the frozen earth underneath, and in this manner sufficient mould was obtained to lay out proper beds. In these were then planted seeds, among others radishes brought from Sweden, while several species of the Spitzbergen fauna were planted here. Both flourished remarkably, as did also the rye and oats which we planted here. The latter grew well, although slowly, and were, at the end of July, six to eight centimetres long. Their growth was measured every fifth day, while studies of the sun's chemical influence on the same were simultaneously prosecuted.

The migratory birds continued to arrive: thus on June 2 the brent geese put in their appearance, and in great flocks took possession of the innumerable lagoons. They were, however, very shy, and comparatively few were shot. Of wild reindeer several were shot, and one Polar bear was seen, but escaped.

At last on June 26, at 4 p.m., the first reminder of the outside world appeared in the shape of a fishing smack, but, although every effort was made to attract attention, she passed northwards. On July 8 an expedition was despatched to Cape Staratschin, the "general post-office" of Spitzbergen, which brought back news, letters, and the literature of the civilised world for a whole twelvemonth, the period of our isolation.

Shortly afterwards we had several calls of Norwegian hunters, among whom may be mentioned the well known Capt. Kjeldsen, of the *Isbjörnen*, who participated in the Payer-Weyprecht expedition of 1872, and in the Austrian to Jan-Mayen, 1882-83. He made the remarkable report that he had found the sea at the Norse Islands early in July this summer entirely free from ice, not even seeing the "ice-blink," *i.e.* the light reflected from new ice formed out of sight. This was in the exact spot where the Swedish expedition was compelled to return on account of enormous pack-ice, at the same period in 1882. He was of the opinion that a steamer would have been able to penetrate very far north of the Seven Islands this summer.

In the middle of August the relief boat *Urd* arrived, and, after having cleared the houses, and nailed up the windows and doors, we went on board, and steamed out of the Ice Fjord on August 25, having for a period of exactly 400 days, contributed our quota to International Polar research.

THE WEIGHTS OF BRITISH NOBLEMEN DURING THE LAST THREE GENERATIONS

IT is of considerable interest to know in an exact way the amount of change that may have occurred in our race during recent generations. I therefore send the following results concerning the changes in weight, which I have calculated from data obligingly furnished to me by Messrs. Berry, of 3, St. James's Street, London. Messrs. Berry are the heads of an old-established firm of wine and coffee merchants, who keep two huge beam scales in their shop, one for their goods, and the other for the use and amusement of their customers. Upwards of 20,000 persons have been weighed in them since the middle of last century down to the present day, and the results are recorded in well-indexed ledgers. Some of those who had town houses have been weighed year after year during the Parliamentary season for the whole period of their adult lives. I examined two of the ledgers at my own house, and was satisfied of their genuineness and accuracy; also that they could be accepted as weighings in "ordinary indoor clothing" unless otherwise stated. Much personal interest attaches itself to these unique registers, for they contain a large proportion of the historical names in our upper classes.

I have ventured to discuss only a small and definite part of this mass of material, and I selected the nobility for the purpose, because the dates of their births could be easily learnt, which had to be done in order to connect the years in which they were weighed with their ages at the time. They formed a more homogeneous group than one that included younger brothers and men about town, who marry late and lead less regular lives. I therefore begged Messrs. Berry to find a clerk for me who should make the required extracts under their direction in an anonymous form for statistical purposes. I also asked to be furnished with an alphabetical list of the persons weighed, that I might know generally with whom I was dealing, and that each schedule should bear a reference to the folio whence it was extracted, so that, whenever verification was needed, the original might be referred to. All this was done, and I am in possession of 139 schedules referring to as many different persons, namely, 109 peers, 29 baronets (who were added as makeweights), and 1 eldest son of a peer. They were born at various times between 1740 and 1830, or thereabouts. Each schedule gives the age and year of the several weighings, the highest and lowest weights recorded in that year, and a copy of such remarks as were entered at the time about the dress. An age-weight trace similar to those in Figs. 1 and 2 was plotted on a large scale on each schedule. My best thanks are due to Messrs. Berry for their careful oversight of the tedious clerical work and for the intelligent assistance they gave in having it satisfactorily accomplished.

Specimens of the Age-Weight Curves of Individuals

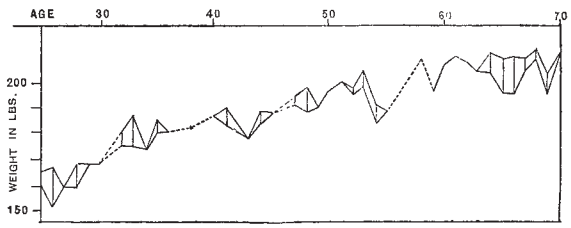

FIG. 1.—One-fourth of the Series are more irregular than this Specimen. (The Upper Quartile.)

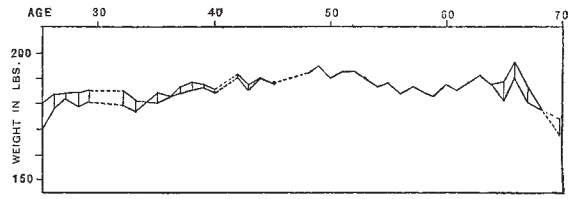

FIG. 2.—One-fourth of the Series are less irregular than this Specimen. (The Lower Quartile.)

The age-weight traces differ widely and in many ways: (1) in the annual range of weight, (2) in its fluctuations from year to year, (3) in the age at which the weight reaches its maximum, (4) in the bluntness of the culminating point.

The annual range is shown in Figs. 1 and 2 by the short, vertical lines that connect the upper and lower contours. The top of each line corresponds to the highest weight recorded in the year to which it refers, and the bottom of the line to the lowest. I find the average annual range in my whole series of cases to be 6 lbs., and that, in the successive decades extending over ninety years, it has decreased prettily steadily from 7 lbs. to 5 lbs. This points to an irregularity in the mode of life that was greater two or three generations back than now, and we shall shortly see that it is by no means a solitary indication of this well known fact. It would be interesting to learn how much annual irregularity in the weight of an adult is consistent with perfect health.

The only evidence I know that could throw much light upon it is summarised in a Parliamentary paper on prison discipline,[1] whence it appears (p. 54) that a certain amount of irregularity is normal among prisoners, that they are heavier in summer than in winter, and that the changes are abrupt; also, that fluctuations in weight, bearing no sort of proportion to previous changes of diet, are of constant occurrence.

I calculated a rough numerical measure of the irregularity of each trace for the purpose of classifying them. I did so on the same principle that one might adopt to measure the discursiveness of a rambling path, in comparison with that of a straight turnpike road between the same points, namely, by finding the proportion that the length of the one bore to the other. I measured the trace and also the general sweep of the trace with a map-maker's "perambulator," divided one by the other, and corrected each result on the principle that a fluctuation of 12 lbs. in a man of 16 stone should not count more than one of 9 lbs. in a man of 12 stone. I also exercised some judgment in my measurements, to avoid the error of dealing with ups and downs in the trace that were apparently due to the fragmentary character of the observations (sometimes only one record in a year, and sometimes two), as if they were real fluctuations. Each available trace was marked on this principle, and the traces were classified according to their marks. Figs. 1 and 2 are the "quartiles" of this class.

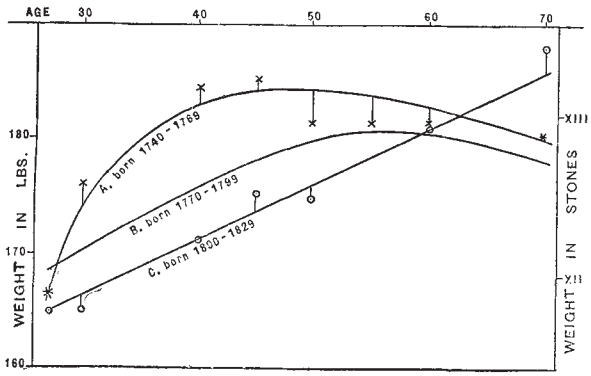

FIG. 3.—Mean Age-Weight of British Noblemen in three successive generations.

One quarter of all the traces are more irregular than Fig. 1, one quarter are less irregular than Fig. 2, and the remaining two quarters lie between them. The "median" trace occupies the half-way position; it is unnecessary to reproduce it here, as an imaginary interpolation between Figs. 1 and 2 will suffice.

I next divided the traces into three divisions, A, B, and C, according to the dates of birth of the persons they referred to. It happened that each division covered a period of thirty years, so A, B, and C may be taken to represent three successive generations, born respectively between 1740 and 1769, 1770 and 1799, 1800 and 1829. The numbers of traces available for the present purpose were 21, 22, and 26 respectively. It appeared that the most irregular trace in Group C would rank only as the seventh in Group B, and as the fifth in Group A, and yet C contains the greatest number of cases.

There can be no doubt that the dissolute life led by the upper classes about the beginning of this century, which is so graphically described by Mr. Trevelyan in his "Life of Fox," has left its mark on their age-weight traces. It would be most interesting to collate these violent fluctuations with events in their medical life-histories; but, failing such information, we can only speculate on them, much as Elaine did on the dints in the shield of Launcelot, and on looking at some huge notch in the trace, may hazard the guess, "Ah, what a stroke of gout was there!"

The age at which the weight reaches its maximum is earlier in the earlier generations. I attempted eye estimates, and found it comparatively easy to form them in respect to the traces of the earlier period, where the culmination was usually distinct, and found that it frequently occurred at an early age; the number of times in which it took place in the successive decades of life in those days being as follows: under the age of 29, 2 cases; 30-9, 5 cases; 40-9, 6; 50-9, 7; 60-9, 12; 70 and upwards, 2. In the latter generations the culminating point was frequently too indistinct to be localised, so that I am unable to offer a corresponding statement for comparison that would be trustworthy. In short, the development of the latter generations was more regular.

The clearest evidence of the different age-weights in the three generations, A, B, and C, is obtained by comparing their Means. The following is a brief numerical abstract of them to which the number of cases upon which each mean is based is added in a different type below it. The figures in parentheses are doubly meaned results, those to the left being derived from observations made at the ages of 26 and 28, and those to the right from observations at 68 and 72. For purposes of comparison I subjoin the weights of the professional classes, extracted by interpolation from the table, published by the Anthropometric Committee of the British Association in their Report, 1883, p. 40. The number of observations on which these are based, are given in a form that does not admit of strict comparison with those of my series. They are 24, for observations at the ages 30-35; 24, for 35-40; 44, for 40-50; 13, for 50-60; 5, for 60-70.

Mean Weights at Various Ages

Class	Years of Age					
	27	30	40	50	60	70
A	(166) (13)	176 18	184 24	181 21	181 18	(180) (12)
B	(168) (24)	171 23	172 24	184 26	178 26	178) (15)
C	(165) 35	165 44	171 43	175 37	181 32	(188) (7)
Professional	161	167	173	174	174	—

These figures are rendered much more expressive by translating them into smoothed curves; those from which A was drawn are shown by crosses; those from which C was drawn are shown by small circles; but those from which B was drawn are omitted for clearness' sake.

Whatever may be the exact significance of these mean values, which is by no means so clear as may at first sight be imagined, and whatever may be their absolute worth, which I do not rate very highly, there can be no doubt as to their differential importance. They show with great distinctness that the noblemen of the generation which flourished about the beginning of this century attained their meridian and declined much earlier than those of the generation 60 years their juniors. They were nearly a stone heavier at the age of 40.

The weights of these two generations were identical at the age of 62 or 63, but at that period of life the earlier generation was declining in weight with almost the exact

[1] Copies of correspondence between the Secretary of State for the Home Department and the Inspector of Prisons, &c., and the Report of a Committee, &c. Ordered to be printed May 20, 1864.

speed at which the latter was continually rising. The steadiness of the rise of the latter from early manhood to late years is very striking; it is almost in a straight line. I have not sufficient data to justify me to say when its curve culminates; I have closed it at 70 with a dotted line.

It is only necessary to add that the ledgers of Messrs. Berry are a quarry from which, with some labour, much further information of the kind just given might be drawn. Perhaps the publication of this paper will suggest methods of treating them that have not occurred to myself.

FRANCIS GALTON

THE ERUPTION OF KRAKATOA[1]

"SIXTEEN volcanoes now working between the spot where Krakatoa was before and Sebesie." Such was one of the first reports which was sent by cable to Singapore, and which we heard at Pontianak. Never before had we been so longing for news from Java, for when H.M. ship *Hydrograaf* steamed into the Padang-Tikar River, we heard heavy detonations and explosions like far-off shots, so that we were alarmed about Java. As we expected, our ship was soon ordered to survey the Sunda Straits. This survey was finished at the end of October, and the reader will probably feel interested to know what really has happened there.

Krakatoa has not entirely disappeared, while, till now, no new volcanoes are visible in the neighbourhood. But the report that new islands were said to have

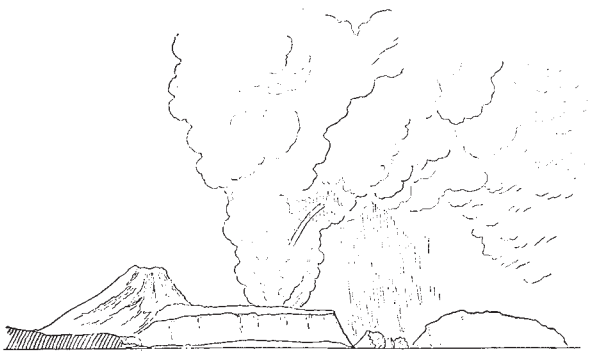

FIG. 1.—Krakatoa during the eruption of May, after a drawing of the Military Survey Bureau, Batavia.

arisen between Sebesie and Krakatoa is easily to be explained, for the new islands are like a mass of smoking and steaming rocks, and if seen from afar they may easily suggest the idea of a great number of working volcanoes. But, when looked at closely, it appeared that the masses of rock were composed of hot pumice-stone, mixed with eruptive masses. In them there were a great many cracks and splits, in which, by the heavy breakers, steam of water was continually generated.

The northern part of the island has entirely disappeared. At what is now the northern edge the peak rises nearly perpendicularly from the sea, and forms a crumbled and rugged wall, and shows a vertical cutting (which is more than 800 metres high) of Krakatoa.

Where was land before, there is now no bottom to be found; at least we could not fathom it with lines of 200 fathoms (360 metres) long. When we had quite calm weather, and steamed slowly and cautiously to and fro along the base of the peak, or had turned off steam and let the ship drift, and were busy in measuring the depth, we could distinctly see the different strata and rocks of the bare, opened mountain. Only here and there a slight trace of melted volcanic matter was to be seen, which, after half of the mountain had crumbled away, had flowed over the wall, which is still there. What remains of the slopes is covered with a grayish-yellow stuff (which, as plainly appears, had been in a melted or fluid state), full of cracks or splits from which steam is continually coming out.

In the same way steam is also coming forth from the deeper cracks of the steep wall, which is still remaining. Sometimes this is accompanied by slight explosions; at that time clouds of brown dust fly up from the cracks, and stones roll down which are often so big as to disturb the sea around the entire base of the mountain. Our

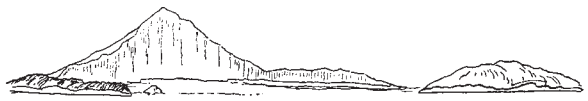

FIG. 2.—Krakatoa after the eruption in May, after a drawing of the Military Survey Bureau, Batavia.

entire survey of the north of Krakatoa suggested the idea that we were above a crater which had been filled with water and quenched by it, and this idea was still strengthened on observing that the decrease of depth, south of Sebesie, had principally been caused by matters which were cast out and flung away.

Almost in every place here the lead came up from the bottom, filled with black sand or carbonised dust, sometimes mixed with pulverised pumice-stone and little black stones, which apparently had been in a red-hot or melted state. Moreover, the soundings were very different, and the new rocks resemble clods of substances which, when

FIG. 3.—Peak of Krakatoa after the eruption in August, by M. C. van Doorn.

in a melted or very hot state, had contact with water. Probably such a whimsical shape of the rocks above the sea-level suggests the state of the bottom of the sea in the neighbourhood. The stones were still too hot to allow us to discover whether massive stones are under the pumice-stone also. It was not difficult, it is true, to knock off large pieces of these rocks by a hatchet or a chopper, but when a big block fell unexpectedly down, the sailors had often to flee on account of the gases which suddenly arose. The knocked off pieces which were brought on board were still warm after they had been in the boat for an hour.

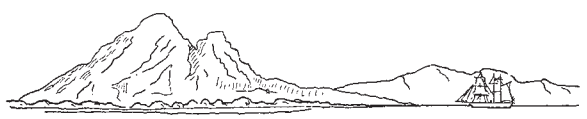

FIG. 4.—Peak of Sebesie and the volcanic rocks before it, by M. C. van Doorn.

As is to be seen from the map, a great part of the lost ground of Krakatoa is found again at the bottom of the sea, a few miles to the north at least, if we suppose that no undulations of the ground took place. After having passed the limits to which the matters were thrown out, one finds the same soundings as were found before, and the decrease of depth is so local that the idea of an upraised bottom is dissipated at once. If such an elevation had taken place, it certainly would be remarked over a far greater extent and be more regularly ascending and descending. The firmer and stronger part of the crater wall, the peak of Krakatoa, which is still there,

[1] By M. C. van Doorn, officer in command of H.M ship *Hydrograaf*. Translated (and partially abridged) by E. Metzger from *Eigen Haard*, 1883, No. 51.